Effect Of Bleaching On The Coral Host Total Lipid Content, Lipid Class Composition, And Skeletal Stable Isotopic Composition*

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Mass coral bleaching events occur on a global scale throughout the world's tropical oceans and can result in large-scale coral mortality and degradation of coral reef communities and structure (Glynn, 1996; Reaser *et al*., 2000; Wilkinson, 2000). For any given event, bleaching severity and mortality varies between individual corals, coral species, depths and geographic locations (i.e.: (Edmunds, 1994; Fisk and Done, 1985; Hoegh-Guldberg and Salvat, 1995; Marshall and Baird, 2000; Wilkinson, 2000). Much research has concentrated on the variation in the *Symbiodinium* zooxanthellae type to explore this variation in bleaching. However, less research has been oriented towards examining the effect of bleaching on the animal fraction. In the absence of their zooxanthellae and/or photosynthetic pigments that normally supply the coral animal with up to 100% of its daily metabolic energy requirements (eg.: (Muscatine and Cernichiari, 1969; Muscatine *et al*., 1984; Patton and Burris, 1983), bleached corals may have to rely heavily on lipid stores to supplement and/or to support their daily metabolic energy needs. In bleached Caribbean corals, translocation of fixed carbon from zooxanthellae to coral host is estimated to decreased by ~50% (Porter *et al*., 1989). Decreases in the total amount of carbon, nitrogen, lipid, and tisuue biomass in some species of bleached Caribbean corals suggest that some species of corals consume their own structural material to survive bleaching periods without nutritional input from their zooxanthellae (Szmant and Gassman, 1990; Fitt et al 2000). However, in other coral species, energy reserves (protein, biomass, and glycerol) do not change when bleached (Grottoli-Everett 1995; Fitt et al. 2000; Edmunds et al. 2003). In addition, skeletal stable carbon isotopic composition ($d^{13}C$) in symbiotic corals is primarily influenced by metabolic fractionation (Grottoli, 1999; Grottoli, 2002; Grottoli and Wellington, 1999) during photosynthesis and respiration (Grottoli, 2002; Grottoli and Wellington, 1999; McConnaughey, 1989a; McConnaughey, 1989b; McConnaughey *et al*., 1997; Muscatine *et al*., 1989; Swart, 1983). Changes in the skeletal $d^{13}C$ in corals during bleaching may lend further insight into the metabolic activity in the coral. Here we show that bleaching in two species of Hawaiian corals results in species-specific responses in total lipid concentrations, lipid class composition, and skeletal stable isotopic values.

Approximately ten weeks after the onset of a natural bleaching event on the coral reefs of Kaneohe Bay, Hawaii in 1996, several *Porites compressa* and *Montipora capitata* corals were collected. Corals ranged from totally white in appearance (bleached) to dark brown (non-bleached). Chloropyll *a* (Chla), total lipid concentration, and lipid class composition was measured in each coral. $d^{13}C$ of the skeleton immediately underlying the animal tissue was also measured. Naturally bleached *P. compressa* corals depleted their total lipid stores while *M. capitata* corals maintained them. Further investigation into unevenly bleached corals revealed that *P. compressa* depleted total lipid stores in bleached areas but

* Web link: http://www.coral.noaa.gov/cmrc/think-tank/grottoli.pdf